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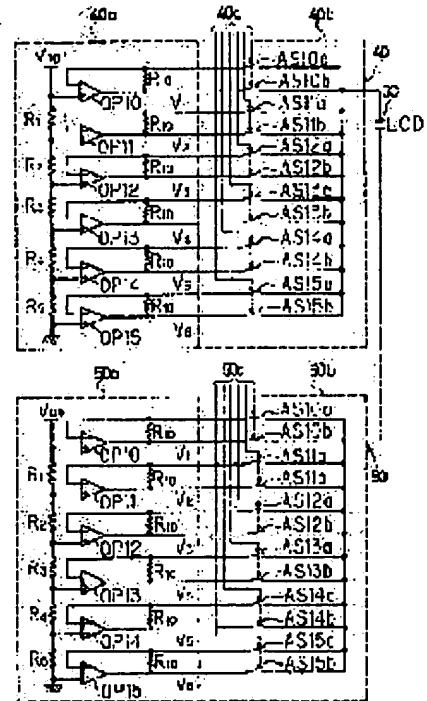
(72)Inventor : OSHIO UMEO

(54) LIQUID CRYSTAL DRIVING CIRCUIT

(57)Abstract:

PURPOSE: To reduce the occurrence of crosstalk by lowering the impedance of an analog switch.

CONSTITUTION: Plural kinds of voltage which are mutually different are respectively supplied to the non-inversion input terminals of plural operational amplifiers OP10-OP15. Output from plural respective operational amplifiers is supplied to plural 1st switches AS10b-AS15b, and the output voltage from the operational amplifier selected by closing the switch is supplied to a liquid crystal panel 30. Plural 2nd switches AS10a-AS15a are closed by interlocking with plural respective 1st switches, and the output voltage from the operational amplifier selected by the closed 1st switch is fed back to the inversion input terminal of the operational amplifier.



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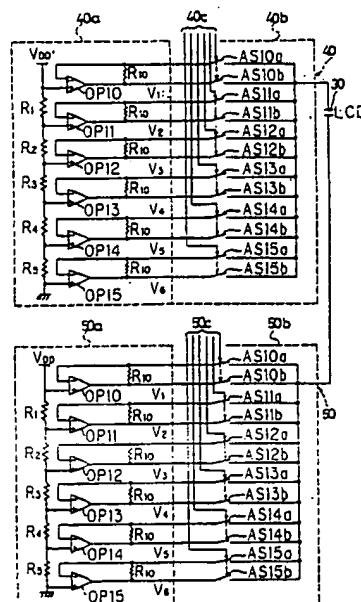
(54)【発明の名称】 液晶ドライブ回路

(57) [要約]

【目的】 本発明は液晶ドライブ回路に関し、アナログスイッチのインピーダンスを低下させてクロストークの発生を低減することを目的とする。

〔構成〕 複数の演算増幅器（OP10～OP15）は、互いに異なる複数の電圧夫々を非反転入力端子に供給される。複数の第1のスイッチ（AS11b～AS15b）は、複数の演算増幅器夫々の出力を供給され、閉成により選択した演算増幅器の出力電圧を液晶パネル（30）に供給する。複数の第2のスイッチ（AS1a～AS15a）は、複数の第1のスイッチ夫々と連動して閉成し、閉成した第1のスイッチで選択した演算増幅器の出力電圧をその演算増幅器の反転入力端子に帰還する。

本発明回路の回路構成図



【特許請求の範囲】

【請求項1】 互いに異なる複数の電圧夫々を非反転入力端子に供給される複数の演算増幅器(O P 10～O P 15)と、

該複数の演算増幅器夫々の出力を供給され、閉成により選択した演算増幅器の出力電圧を液晶パネル(30)に供給する複数の第1のスイッチ(A S 11 b～A S 15 b)と、

該複数の第1のスイッチ夫々と連動して閉成し、閉成した第1のスイッチで選択した演算増幅器の出力電圧をその演算増幅器の反転入力端子に帰還する複数の第2のスイッチ(A S 10 a～A S 15 a)とを有することを特徴とする液晶ドライブ回路。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は液晶ドライブ回路に関し、液晶に供給する駆動電圧を切換えて発生する液晶ドライブ回路に関する。

【0002】

【従来の技術】 図2は従来の液晶ドライブ回路の一例の回路構成図を示す。同図中、ドライブ回路10, 20夫々は駆動電圧発生部10 a, 20 aと駆動電圧選択部10 b, 20 bにより構成されている。

【0003】 駆動電圧発生部10 a, 20 a夫々は電源電圧V₀₀とアースとの間に設けられ、電圧V₀₀を分圧する直列接続された抵抗R₁～R₅と、抵抗R₆～R₉夫々の接続点に接続されたバッファを構成する演算増幅器(オペアンプ)O P 1～O P 4とによりなり、電圧V₁ (=V₀₀), V₂, V₃, V₄, V₅, V₆ (=0)を発生する。

【0004】 駆動電圧選択部10 b, 20 b夫々は上記の駆動電圧発生部10 a, 20 aより電圧V₁～V₅夫々を一端に供給され他端を共通接続されたアナログスイッチA S 1～A S 6で構成されており、アナログスイッチA S 1～A S 6は端子10 c又は20 cよりの制御信号に従って単一のアナログスイッチが閉成され、これによって液晶パネル30の対向する電極に電圧を印加しダイナミック駆動により表示を行なう。

【0005】

【発明が解決しようとする課題】 上記選択部10 b, 20 b夫々のアナログスイッチA S 1～A S 6夫々のインピーダンスはKΩオーダーで比較的大きく、液晶パネル30の容量とアナログスイッチのインピーダンスによる時定数が大きなものとなり、アナログスイッチの閉成時及び閉成時の液晶パネル30の印加電圧の立ち上がり及び立ち下がりがなまってクロストークが発生しやすくなるという問題があった。

【0006】 本発明は上記の点に鑑みなされたもので、アナログスイッチのインピーダンスを低下させてクロストークの発生を低減する液晶ドライブ回路を提供することを特徴とする。

とを目的とする。

【0007】

【課題を解決するための手段】 本発明の液晶ドライブ回路は、互いに異なる複数の電圧夫々を非反転入力端子に供給される複数の演算増幅器と、複数の演算増幅器夫々の出力を供給され、閉成により選択した演算増幅器の出力電圧を液晶パネルに供給する複数の第1のスイッチと、複数の第1のスイッチ夫々と連動して閉成し、閉成した第1のスイッチで選択した演算増幅器の出力電圧をその演算増幅器の反転入力端子に帰還する複数の第2のスイッチとを有する。

【0008】

【作用】 本発明においては、選択されて第1のスイッチが閉成するとき第2のスイッチも共に閉成して、演算増幅器より第1のスイッチを通して液晶に供給される出力電圧がこの演算増幅器の反転入力端子に供給されるため、この第1のスイッチのインピーダンスが見掛け上低下され、このインピーダンスと液晶パネルの容量による時定数が従来に比して大幅に小さくなる。

【0009】

【実施例】 図1は本発明の液晶ドライブ回路の一実施例の回路構成図を示す。同図中、図2と同一部分には同一符号を付す。

【0010】 図1において、ドライブ回路40, 50夫々は駆動電圧発生部40 a, 50 aと駆動電圧選択部40 b, 50 bにより構成されている。

【0011】 駆動電圧発生部40 a, 50 a夫々は電源電圧V₀₀とアースとの間に設けられ、電圧V₀₀を分圧する抵抗R₁～R₅と、抵抗R₆～R₉で分圧された電圧V₁ (=V₀₀), V₂, V₃, V₄, V₅, V₆ (=0)夫々を非反転入力端子に供給されたオペアンプO P 10～O P 15とによりなる。オペアンプO P 10～O P 15夫々の出力端子は大抵抗値の出力安定化用抵抗R₁₀を介して夫々の反転入力端子に接続されている。

【0012】 また、駆動電圧発生部40 a, 50 a夫々のオペアンプO P 10～O P 15夫々の出力端子は駆動電圧選択部40 b, 50 b夫々の第1のスイッチであるアナログスイッチA S 10 b～A S 15 b夫々の一端に接続され、オペアンプO P 10～O P 15夫々の反転入力端子は第2のスイッチであるアナログスイッチA S 10 a～A S 15 a夫々の一端に接続されている。駆動電圧発生部40 b, 50 b夫々のアナログスイッチA S 10 a～A S 15 a, A S 10 b～A S 15 bの他端は共通接続されて液晶パネル30の対向する電極に接続されている。

【0013】 アナログスイッチA S 10 aとA S 10 b, A S 11 aとA S 11 b, A S 12 aとA S 12 b, A S 13 aとA S 13 b, A S 14 aとA S 14 b, A S 15 aとA S 15 bは連動して同時に開閉成を行ない、駆動電圧選択部40 b, 50 b夫々のアナログ

スイッチAS10a, AS10b～AS15a, AS15bは端子40c, 50c夫々よりの制御信号に従って単一の組のアナログスイッチが閉成される。上記の制御信号は表示内容に応じて生成されている。

【0014】ここで、例えば、駆動電圧選択部40bのアナログスイッチAS11a, AS11bのみが閉成され、駆動電圧選択部50bのアナログスイッチAS15a, AS15bのみが閉成されて液晶パネルの対向する電極夫々に電圧V₁, V₂が印加され、上記駆動電圧選択部40b, 50bの出力電圧を順次切換えて液晶パネル30をダイナミック駆動により表示を行なう。

【0015】この場合、出力電圧（例えばV₁）を選択するアナログスイッチ（例えばAS11b）の閉成と共に、これと連動した出力帰還用のアナログスイッチ（例えばAS11a）が閉成して出力を行なうオペアンプ（例えばOP11）の反転入力端子に上記出力電圧（V₁）が帰還される。このため、アナログスイッチ（AS11a, AS11b）のインピーダンスは見掛け上オペアンプの利得Aで除算した値となり、このアナログスイ

ッチのインピーダンスと液晶パネルの容量による時定数は従来に比して大幅に小さくなり、クロストークの発生を低減することができる。

【0016】

【発明の効果】上述の如く、本発明の液晶ドライブ回路によれば、アナログスイッチのインピーダンスを低下させてクロストークの発生を低減することができ、実用上きわめて有用である。

【図面の簡単な説明】

【図1】本発明回路の一実施例の回路構成図である。

【図2】従来回路の一例の回路構成図である。

【符号の説明】

40a, 50a 駆動電圧発生部

40b, 50b 駆動電圧選択部

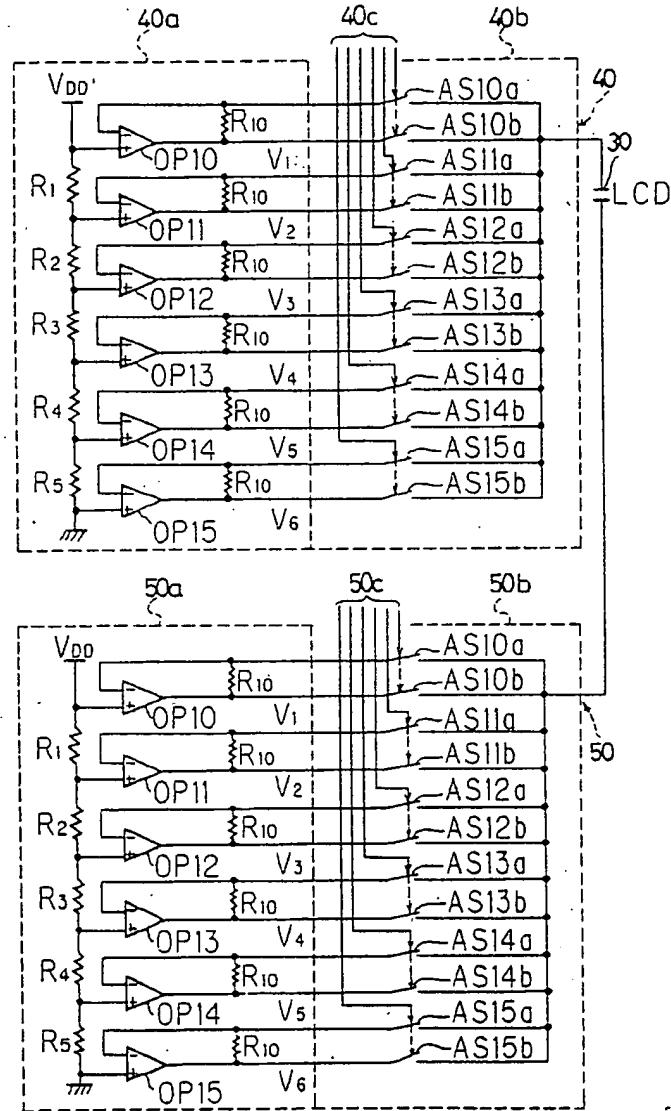
OP10～OP15 オペアンプ

AS10a, 10b～AS15a, 15b アナログスイッチ

R₁～R₅, R₁₀ 抵抗

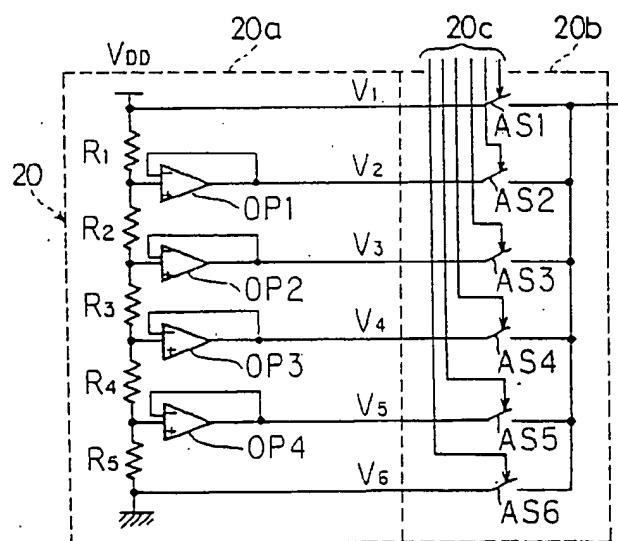
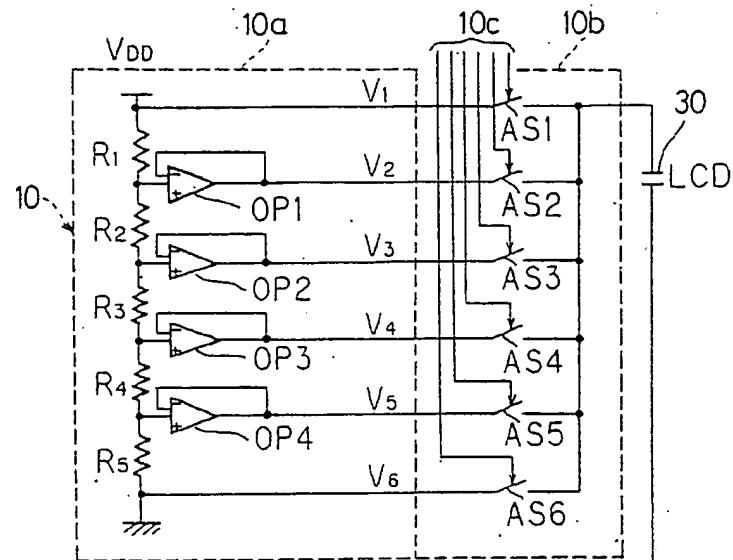
[図1]

本発明回路の回路構成図



[図2]

従来回路の回路構成図



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CLAIMS

[Claim(s)]

[Claim 1] Two or more operational amplifiers to which two or more mutually different electrical potential differences of each are supplied by the non-inversed input terminal (OP10-OP15), Two or more 1st switches which the output of each of two or more of these operational amplifiers is supplied, and supply the output voltage of the operational amplifier chosen by closing to a liquid crystal panel (30) (AS11b-AS15b), The liquid crystal drive circuit which is interlocked with these each of two or more 1st switches, closes and is characterized by having two or more 2nd switches (AS10a-AS15a) which return the output voltage of the operational amplifier chosen with the 1st closed switch to the inversed input terminal of the operational amplifier.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the liquid crystal drive circuit which switches the driver voltage supplied to liquid crystal, and is generated about a liquid crystal drive circuit.

[0002]

[Description of the Prior Art] Drawing 2 shows the circuitry Fig. of an example of the conventional liquid crystal drive circuit. The drive circuit 10 and 20 each consist of the driver voltage generating sections 10a and 20a and the driver voltage selection sections 10b and 20b among this drawing.

[0003] the driver voltage generating sections 10a and 20a -- resistance R1 -R5 which each is prepared between supply voltage VDD and a ground, and pressures an electrical potential difference VDD partially and by which series connection was carried out Resistance R1 -R5 It consists of operational amplifiers (operational amplifier) OP1-OP4 which constitute the buffer connected at each node, and an electrical potential difference V1 (= VDD), V2, V3, V4, V5, and V6 (= 0) are generated.

[0004] Driver voltage selection section 10b and 20b each is electrical-potential-difference V1 -V6 from the above-mentioned driver voltage generating sections 10a and 20a. It consists of analog switches AS1-AS6 by which each was supplied by the end and common connection was made in the other end. A single analog switch is closed according to the control signal from terminal 10c or 20c, and analog switches AS1-AS6 impress an electrical potential difference to the electrode which a liquid crystal panel 30 counters by this, and display by dynamic drive.

[0005]

[Problem(s) to be Solved by the Invention] the above-mentioned selection sections 10b and 20b -- each analog switch AS1-AS6 -- to Kohm order, it was comparatively large, the time constant by the capacity of a liquid crystal panel 30 and the impedance of an analog switch became big, and each impedance had the problem of the start and the fall of applied voltage of a liquid crystal panel 30 at the time of closing of an analog switch and Kaisei having become blunt, and becoming easy to generate a cross talk.

[0006] This invention was made in view of the above-mentioned point, and aims at offering the liquid crystal drive circuit which the impedance of an analog switch is reduced and reduces generating of a cross talk.

[0007]

[Means for Solving the Problem] Two or more operational amplifiers with which two or more mutually different electrical potential differences of each are supplied to the liquid crystal drive circuit of this invention by the non-inversed input terminal, Two or more 1st switches which the output of two or more operational amplifiers of each is supplied, and supply the output voltage of the operational amplifier chosen by closing to a liquid crystal panel, Two or more 1st switches of each are interlocked with, and it closes and has two or more 2nd switches which return the output voltage of the operational amplifier chosen with the 1st closed switch to the inversed input terminal of the operational amplifier.

[0008]

[Function] In this invention, when it is chosen and the 1st switch closes, the 2nd switch is also closed [both], since the output voltage supplied to liquid crystal through the 1st switch from an operational amplifier is supplied to the inversed input terminal of this operational amplifier, the impedance of this 1st switch falls seemingly and the time constant by this impedance and the capacity of a liquid crystal panel becomes small sharply as compared with the former.

[0009]

[Example] Drawing 1 shows the circuitry Fig. of one example of the liquid crystal

drive circuit of this invention. The same sign is given to the same part as drawing 2 among this drawing.

[0010] In drawing 1, the drive circuit 40 and 50 each consist of the driver voltage generating sections 40a and 50a and the driver voltage selection sections 40b and 50b.

[0011] the driver voltage generating sections 40a and 50a -- resistance R1 -R5 which each is prepared between supply voltage VDD and a ground, and pressures an electrical potential difference VDD partially Resistance R1 -R5 The electrical potential difference V1 (= VDD) by which the partial pressure was carried out, V2, V3, V4, V5, and V6 It consists of operational amplifiers OP10-OP15 to which each (= 0) was supplied by the non-inversed input terminal. The output terminal of operational amplifier OP10 - OP15 each is mostly connected to each inversed input terminal through the resistance R10 for output stabilization of an anti-value.

[0012] moreover, the driver voltage generating sections 40a and 50a -- each operational amplifier OP10-OP15 -- each output terminal -- the driver voltage selection sections 40b and 50b -- analog switch AS10b-AS15b which is each 1st switch -- it connects with each end -- having -- operational amplifiers OP10-OP15 -- analog switch AS10a-AS15a each inversed input terminal of whose is the 2nd switch -- it connects with each end. the driver voltage generating sections 40b and 50b -- the other end of each analog switch AS10a-AS15a and AS10 b-AS15b is connected to the electrode with which common connection is made and a liquid crystal panel 30 counters.

[0013] Analog switch AS10a, AS10b and AS11a, AS11b and AS12a, AS12b and AS13a, AS13b and AS14a, AS14b and AS15a, and AS15b interlock, and perform open closing to coincidence. the driver voltage selection sections 40b and 50b -- each analog switch AS10a, AS10b-AS15a, and AS15b -- Terminals 40c and 50c -- according to the control signal of a twist, the analog switch of a single group is closed, respectively. The above-mentioned control signal is generated according to the contents of a display.

[0014] It is an electrical potential difference V2 and V6 to each electrode with which only analog switch AS11a of driver voltage selection section 40b and AS11b are closed, only analog switch AS15a of driver voltage selection section 50b and AS15b are closed here, and a liquid crystal panel counters. It is impressed, the output voltage of the above-mentioned driver voltage selection sections 40b and 50b is switched one by one, and a liquid crystal panel 30 is displayed by dynamic drive.

[0015] In this case, the above-mentioned output voltage (V2) returns to the inversed input terminal of the operational amplifier (for example, OP11) which outputs by the analog switch for output feedback (for example, AS11a) interlocked with this closing with closing of the analog switch (for example, AS11b) which chooses output voltage (for example, V2). For this reason, the impedance of an analog switch (AS11a, AS11b) serves as a value which did the division on the gain A of an operational amplifier seemingly, and the time constant by the impedance of this analog switch and the capacity of a liquid crystal panel becomes small sharply as compared with the former, and can reduce generating of a cross talk.

[0016]

[Effect of the Invention] Like ****, according to the liquid crystal drive circuit of this invention, the impedance of an analog switch can be reduced, generating of a cross talk can be reduced, and it is very useful practically.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the circuitry Fig. of one example of this invention circuit.

[Drawing 2] It is the circuitry Fig. of an example of a circuit conventionally.

[Description of Notations]

40a, 50a Driver voltage generating section

40b, 50b Driver voltage selection section

OP10-OP15 Operational amplifier

AS10a, 10 b-AS 15a and 15b Analog switch

R1 -R5, R10 Resistance

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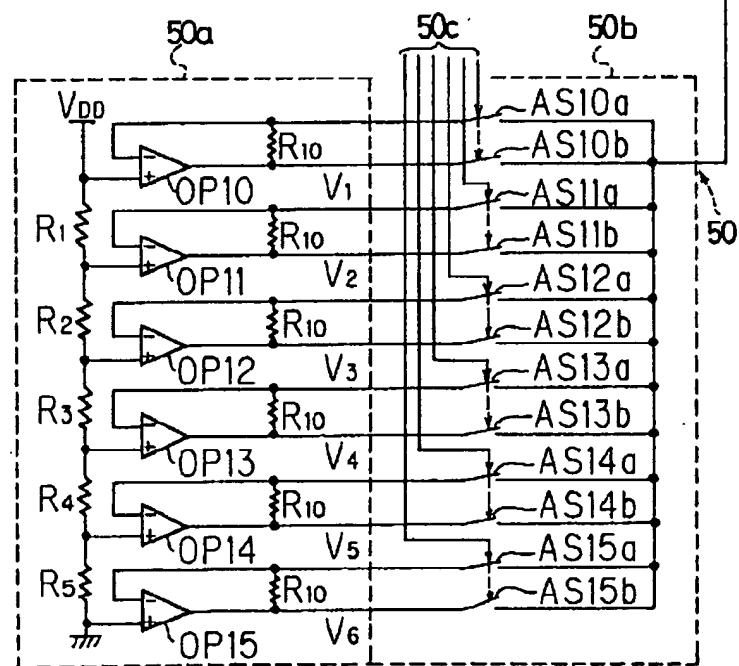
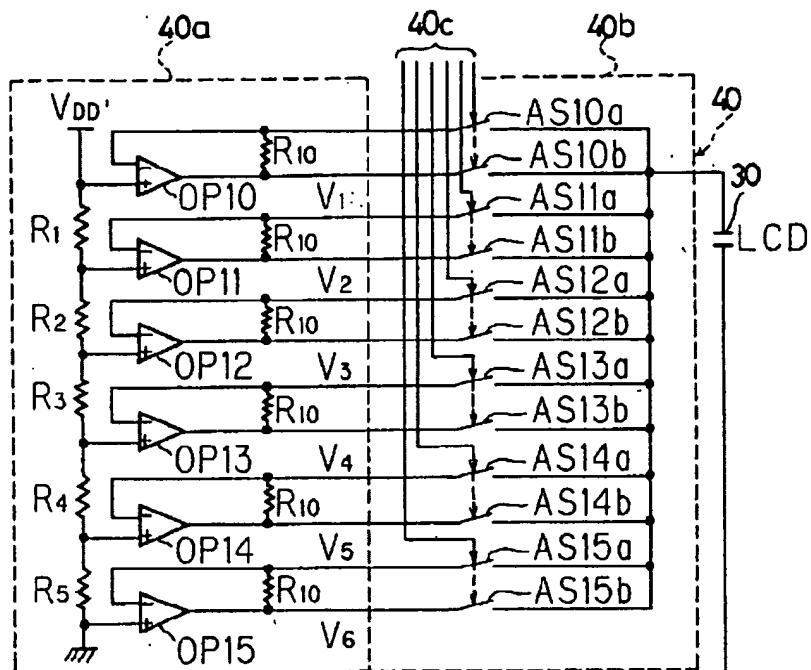
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DRAWINGS

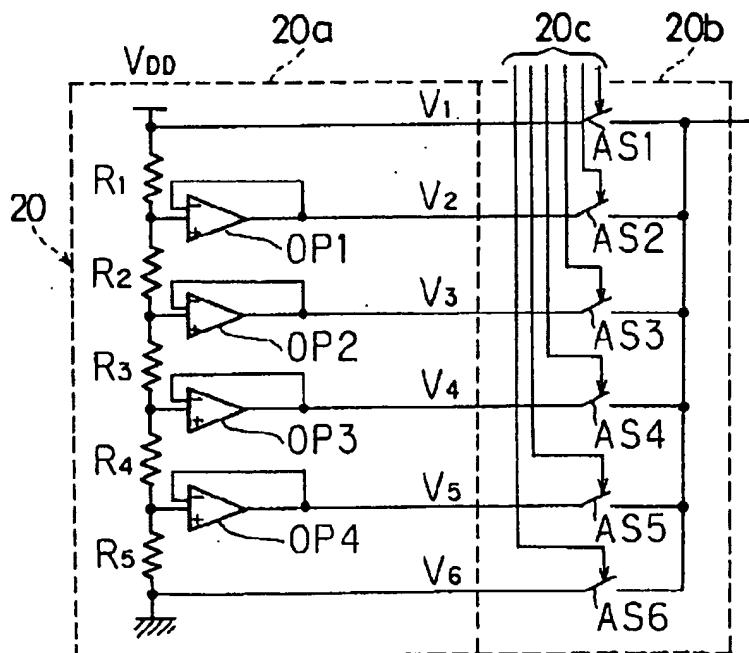
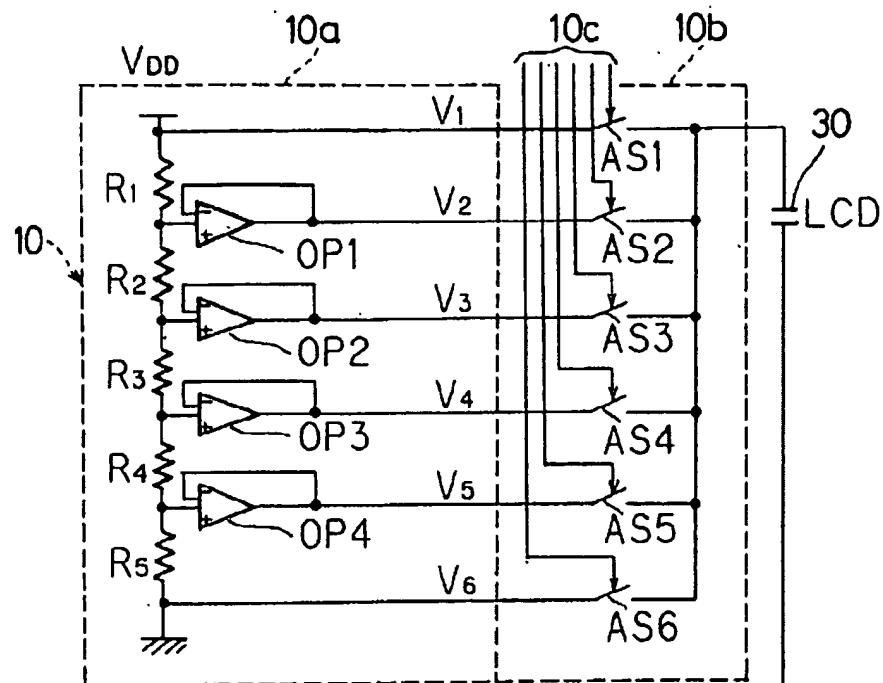
[Drawing 1]

本発明回路の回路構成図



[Drawing 2]

従来回路の回路構成図



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